The Big Bang

B&O surprised us all with its latest creation, a room-correcting speaker of alien aspect, but what on Earth does it sound like? Review by Martin Colloms

B&O has clearly set out to go for broke with this, its new flagship loudspeaker system. And it truly is a system, fully digital, active, with 2500W of built-in power per channel. B&O's design team could not avoid spinning some degree of style and luxury finish on to this avowedly reference product, but for once the electro-acoustic engineers clearly took pole position, not the stylists. Here form most definitely follows function.

The result is a very high specification loudspeaker, potentially with a world-class performance, priced in audiophile territory at, typically, £10,000 per pair. At a stroke, B&O is seeking to renew its credentials as a quality 'hi-fi' maker – in the classical sense of the term; not today's generally debased usage, where it is even applied to the larger transportable CD/radios and 'ghettoblasters'.

Obviously, the Beolab 5 is designed for compatibility with other B&O equipment in terms of signal connection and remote control. But we wanted to know how it could perform as a standalone product, used in non-B&O systems. Could it really compete with specialist audiophile designs in its chosen price bracket?

Its appearance most certainly is distinctive. The conical form, in a matt close-weave cloth finish, is surmounted by two circular reflector sections, tending to fit modern arrangements better than traditional furnishing schemes. Conversely it completely avoids the boring, slab sided veneered-coffin look of most speakers.

Standing waist high (970mm) and about 0.5m in diameter, it weighs 61kg and really needs two people to move it. Installation requires mains power for each unit, a synchronisation link between the two and a single cable from the source/control system. The speakers can take instruction direct via their infra-red receivers, and with a high-quality on-board remote volume control they don't actually need anything more than a digital source, such as a CD player with wired S/PDIF output, to complete an audio system. This is how the speakers were mainly used.

B&O BeoLab 5 loudspeaker	
PRICE	£10,000/pair
SUPPLIER	Bang & Olufsen UK
CONTACT	0118 969 2288
WEBSITE	www.bang-olufsen.dk

Despite their sophistication and complexity, the Beolabs are easy to set up and this is where the high-tech part of the design story begins: a good proportion of that technology has been directed to creating a speaker that sounds more consistent in the face of room quality and placement variations, with an automated calibration feature.

B&O has taken no chances with bass quality, power or bandwidth, but has fitted each enclosure with a down-firing 380mm bass driver to each enclosure, and provided a genuine 1000W of power for it. This is equivalent to a top-quality separate subwoofer. Next in the four-way line-up comes a 170mm lower-mid unit, covering the range 120Hz to 550Hz and powered by 600W of amplification. This is mounted in the upper section of the 'cone' enclosure, concealed under the continuous shape. A 75mm vertically-orientated (upward-firing) soft-dome driver covers the upper-mid, from 550Hz to 2kHz, with 250W of amplification. Finally, also vertically disposed and powered by a 250W amplifier, comes the 25mm soft-dome tweeter.

A patented acoustic lens technology, separately executed for the upper-mid and tweeter units, is used to focus the sound radiation pattern. The pattern is chosen to maximise stereo performance over a broad listening area and to reduce room interaction, promising consistently better sound quality in actual use.

With the upper frequency range thus taken care of, the remaining important variable is the recognised issue at low frequencies, where standing wave modes and differences in room construction may greatly affect bass output and evenness. This is why enthusiasts struggle hard and long with speaker placement.

The Beolab 5 has combined optimally controlled acoustic directionality with an automated room equalisation facility

B&O chose to tackle the problem head on. In the Beolab 5's fully automated calibration system, the room is measured at the speaker locations by each speaker, and appropriate bass correction is then computed and applied to the sound output. A touch of the relevant button on the speaker and away it goes, emitting test tones and at the same time projecting a motorised microphone wand from the base of the speaker to two successive positions a few centimetres apart, to measure the low-frequency room acoustic local to that speaker. A suitably long pressure on the button will reset the speaker to the factory calibration.

TECHNOLOGY

With four power amps per system and a powerful DSP engine (32-bit floating point, 180 Mflop) the speaker drivers are time-aligned and are optimally integrated by high-performance digital filters. The 30 litre subwoofer section is pre-equalised to flatness, extending to around 18Hz at normal powers, but with further compensation applied if you wish by the automated calibration routine described above. In production, the drivers are calibrated to ±0.25dB tolerances to maintain a high standard of tonal balance consistency for the completed systems.

SOUND QUALITY

Without doubt, assessing this remarkable loudspeaker was going to present a challenge. To start with, I used them as instructed, including the use of automatic calibration feature. Fresh from the factory, my pair sounded a bit over-controlled and dry. The image was neither particularly clear or deep, and the bass, though powerful, was rather wooden.

These criticisms are, you understand, made in the context of well-seasoned audiophile speakers. But after a few days, the Beolab 5 began to blossom, showing an unmistakable improvement, particularly if partnered by good digital source components. The running in process clearly involved both electrical and mechanical components.

In my room acoustic, near the ideal position for best tonal balance, both stereo and the uniformity and extension in the bass were well-proportioned. In fact, the Beolab 5 sounded happy enough, without need for further intervention.

Once settled in my first impressions were of a well-balanced speaker, with nicely blended constituents. The promise of those powerful on-board power amplifiers was fulfilled, as it was immediately obvious this speaker offered an excellent dynamic range, of the kind that well-crafted active designs such as the big Meridians can achieve.

As to the bass, Beolab 5 matches the low frequency performance of a prime subwoofer. Such great headroom is most refreshing; the speaker will go louder and louder without muddle or compression, while the bass stayed well in touch, right up to the overall power limit. This loudspeaker can drive very large rooms, while its acoustic adaptability meant it could provide surprisingly good results in really difficult situations.

Moderate colorations were present, an echo of their mechanical origins, such as are present with most speakers. For example, some mild boxiness was apparent in the lower register of acoustic guitar and female voice. Occasionally, sibilants were slightly too 'present', but overall the speaker played well enough in this respect. In this case the colorations were so minor that my memory of my first recognition of them largely faded to nothing as the listening progressed.

The B&O Beolab 5 performed a kind of sleight-of-hand upon its audiences. Time and time again it played music at a level of quality that is customarily encountered at the £10,000 to £15,000 price level, and from avowed international specialists of the art of speaker building. So what's the trick? Those other speakers also need you to spend as much again in terms of supporting amplification, cables, whatever – but that all comes free-on-board with this B&O creation.

Image focus was not over-sharp, yet was more stable than with conventional slab-fronted speakers. Specific images are slightly less crisp and 'compact' than those offered by very low-diffraction models such as the Wilson 7, B&W Nautilus 801 or an Avalon. However, the size of the soundstage was commendable, wide and deep, and the image illusion maintained for a wider audience area than usual; the 'one listener' sweet spot has been largely avoided. Taken overall the stereo quality was very good.

The Beolab 5 was sufficiently transparent and

Beolab 5 creates a wide and deep soundstage; the 'one listener' sweet spot has been largely avoided

highly resolved to genuinely rate as an audiophile design. If the Quad ESL-63 is taken to represent an ideal tonal balance, then the Beolab 5 sounds a bit leaner and a mite clinical, yet such was the available extension and sheer might of its low frequency output that it never sounded small or thin.

Some aspects were striking. From the upper-mid to the treble, the sound was very open, crisp and explicit. Percussion transients were properly portrayed in the three-dimensional soundfield. The sound in the room was most natural, thanks to the wider energy dispersion in the upper range which gave a lively, airy effect.

In addition, the overall gain in performance delivered by the use of direct-coupled 'active' speaker technology lifts the Beolab 5 well beyond the norm. On digital drive this speaker delivered lively dynamics and with above-average rhythm and timing, while the overall effect of the scale and bandwidth was undoubtedly very impressive.

Comparing analogue and digital signal inputs, the use of the analogue inputs connection involved a further conversion to digital within the Beolab 5, and you can hear it. The sound quality was now heard to be not as clearly etched, the soundstage not as deep, not so highly resolved nor so dynamically involving. Of course, the price and quality of those necessarily long analogue cables matters as well. Careful tests showed that on digital input mode the standard B&O coaxial cable was just fine, and no significant gain was obtainable with audiophile digital cable. The Beolab 5 worked very well on its analogue input for general-purpose use, but the full performance was only attained through the digital connect.

CONCLUSION

The Beolab 5 is a *tour de force*, for both the design team at B&O and the industry as a whole. It has combined challenging innovations in the fields of optimally controlled acoustic directionality, with an intriguing and effective, wholly automated room EQ facility; either feature would have been adequate to distinguish a new design, but in addition to this, B&O has also included ICE power high-efficiency amplification with a generous total of 2.5kW per channel for four-way active loudspeaker drive, organised by a powerful DSP engine, generating fully-corrected crossover algorithms.

> Its adaptability will mean surprisingly good sound will be possible even with difficult room arrangements

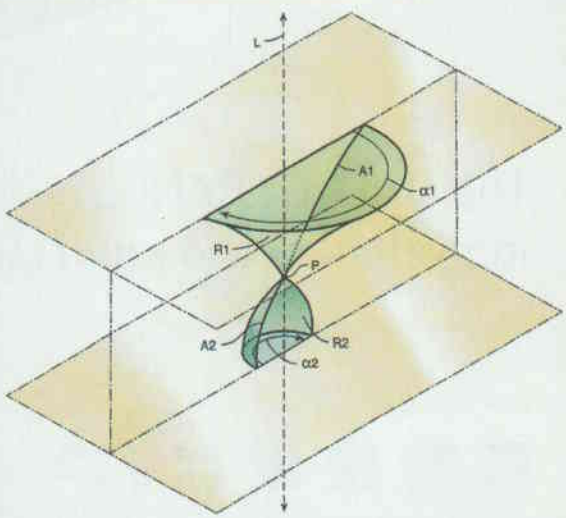
The Beolab 5 had a very wide dynamic range, a very wide and even frequency response, low distortion and precise and stable stereo imaging. Its adaptability means that surprisingly good sound will be possible even with difficult room arrangements.

Nothing has been left to chance, from the generous 380mm woofers to the control interfaces, usable with any system including those from B&O. The result is a highly capable, relatively compact and thoroughly modern loudspeaker. In fact, I found this a musical, neutral and informative product, quite well-timed and thoroughly credible, if a touch restrained in its overall dynamic expression. This BeoLab 5 really is whole lot of loudspeaker for the money, and should be put on your wish list, taking note for the value for money stakes that in this design the amplifiers and remote volume facility come free of charge! ■

B&O's acoustic lenses provide almost 180° of horizontal radiation

B&O'S ACOUSTIC LENS

Conventionally, drivers are placed on the front plane of a loudspeaker enclosure. The enclosure generally shadows sound from radiating to the back, while the spread of sound to the front is reduced with increasing frequency as the wavelength of sound in air becomes comparable with the size of the source. Designers seek to address the non-uniformity of sound distribution over the frequency range by using drivers of reducing size with frequency and the results can be very good, especially when allied to low-diffraction tapered cabinet geometry, as exemplified by the Wilson WATT, the Avalon pistonic dome speakers and the low diffraction pod technology extensively worked on by B&W. However, the Beolab 5 uses an 'acoustic lens' principle developed and patented by Manny LaCarrubba of SAW (Sausalito Acoustic Works, California) and licensed to B&O. In essence, the technology places a driver at one focus of a three dimensional elliptical reflector, whereby the energy is reflected to the second focus, where it is redirected to the smooth curved directive expansion surfaces. These provide almost 180° of horizontal radiation, with a focused 35° control in the vertical direction. After further refinement based on psychoacoustic and computer-generated models which benefited from advanced B&O research in image perception, the production lenses were designed.



LAB REPORT

Looking at those strange slot-like radiating reflectors, I was frankly sceptical about their potential to give good frequency responses. But I needn't have worried, this speaker measured really well.

The Beolab 5's impulse response is well worth reproducing. Its fidelity to a filtered digital impulse form is so well time- and transient-aligned that it compares with the industry reference in this respect, the Quad ESL-63 electrostatic [Figure 1].

Figure 2 shows the primary, forward frequency response for which the last few kilohertz is somewhat dependent on the precise vertical azimuth. The response extended from a very low 20Hz right up to 20kHz for ±2.5dB limits, despite the use of those acoustic lenses. They must be very good, and in fact just how good can be gauged from Figure 3. Here the uniformity of horizontal directivity was seen to be extraordinary, like the reference performances of the Quad '63 and the big Tannoy Dual Concentric. The off-axis response closely mirrors the axial result right to 45°. Beyond this, the Beolab 5's performance pulls away from the other two speakers, maintaining a flat response even for a full 180° arc, just as claimed. In the vertical plane (not shown on the graph) a similar uniformity was seen for a 45° solid angle, falling away outside these limits, and so delivering the designed directivity performance.

FREQUENCY RESPONSE

Nearfield measurement showed that the effective crossover points were at about 120Hz, 550Hz, and 2kHz, with the bass and lower-mid drivers operating in their pure piston range, and time-aligned using fully-corrected digital crossovers.

The upper-mid dome continues to about 2kHz whereupon the final driver, the 25mm dome tweeter takes over. On its ideal axis, it held within 2dB to 20kHz, and with a finite ±2dB limit pass band from 4kHz upwards. The directivity and uniformity of response shown overall was simply excellent. Fine energy-versus-time behaviour was revealed by a MLSSA waterfall display. Comparison tests showed that the automatic low frequency equalisation was effective up to about 200Hz and that the local compensation generated was quite effective. For reference purposes, the measurement of room spatial average was done for the laboratory 'flat' speaker setting and here, while mild bass gain was evident, the overall trend was very smooth and carried a very extended bass response, in fact flat to 17Hz [Fig 4]. After auto equalisation, a still better balanced curve resulted, shown in green.

DYNAMIC RANGE

This is a powerful yet compact speaker and I wanted to confirm its credentials with respect to dynamic range and distortion. A very powerful 108dB was available for a stereo pair in a medium sized room, while the distortion results were interesting. At 86dBA, a fairly loud 'cruising' level, and for this calibre of active speaker, distortion should be low – and it was. At 5kHz in the treble we had second harmonic dominant at a creditable –60dB (0.1%). For 50Hz bass tone at this level, I got much the same figure. At a moderately higher level of 90dBA, now testing the upper-mid dome, a typical –50dB (0.33%) was still good, while 90dBA at 250Hz for the lower-mid cone driver gave much the same result. Gradual increases in distortion were seen at increasing power and sound level. 96dBA is a rather loud continuous level, yet here the tweeter still gave better than –50dB of distortion and the upper-mid was still tolerably good at 0.5% of distortion, this dominant second harmonic and thus acceptable.

CRANKING IT UP

Even at 25Hz the speaker would deliver 96dB before the onset of audible limiting. It could pull 100dBA before the automatic cutback set in. 35Hz at 100dBA was available pre-clip, if at a 10% distortion level (acceptable for such a low frequency). A massive 100dBA was possible at 50Hz and, unlike a separate subwoofer, these speakers worked as a stereo pair delivering still more room power. 90dBA for 50Hz gave a low distortion of 0.2% so the magnet and mechanical system of the 380mm woofer are of low distortion design. Taken overall, these were a very good set of lab results for a subjectively very good speaker.

Figure 1: Impulse response

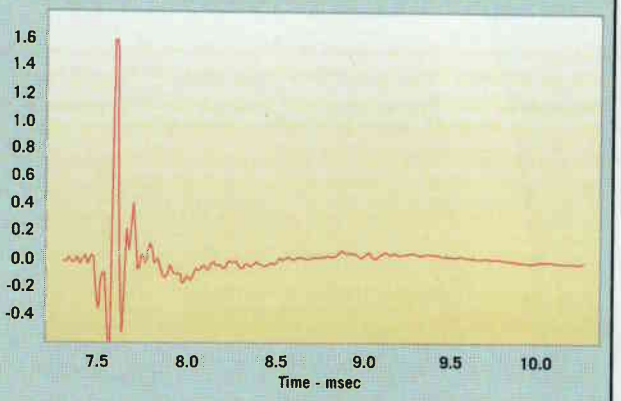


Figure 2: Primary, forward frequency response

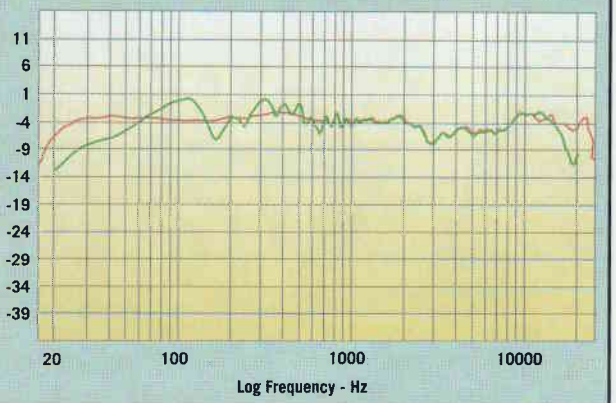


Figure 3: Frequency response

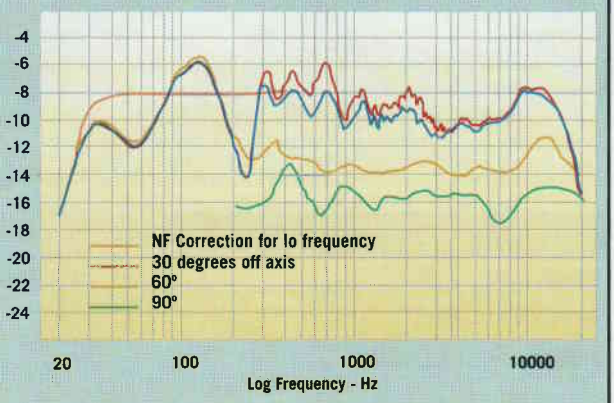


Figure 4: Frequency response